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DISCLOSURE OF INVENTION
with Author's Certificate

(61) 795077
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(53) 622.271.3 (088.8)
(56) USSR Patent No. 705077, Cl. E21 C 41/06, 1978 (Prototype)

(54) (57) TREATMENT METHOD FOR QUARRY FACES, per patent No. 705077, characterized in that, to improve the quarry face stability and to decrease its deformation of multilayered structures with various resistances to shear stress by means of concave-convex bank slope profile, intermediate rows of shortened vertical holes are drilled between the second to last and last rows of boreholes. The nearest one to the last row is drilled to the foot of one of the subjacent layers, and the last one – to the foot of one of the superjacent layers. A straight line drawn between the bottoms of the boreholes in the last row and in the intermediate row closest to the last row shall be at 35 – 45° to horizontal, sloping down towards to mined area with length of less than 0.7 of the depth of the boreholes in the second to last row.

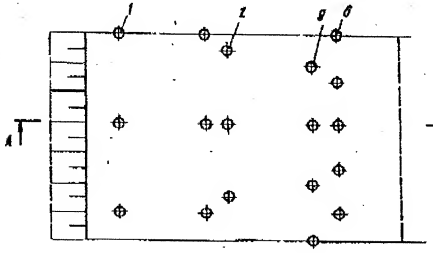

Fig 1.

The invention belongs in the realm of mining industry.

In general, Patent No. 795077 describes the method of processing quarry faces that includes drilling boreholes in a number of rows, charging the boreholes with explosives, blasting and hauling away the mined rock. Here, the second to last and the last rows are drilled to the bottom edge of the slope foot and the last row of boreholes – to get the borehole bottoms in contact with the plane of the newly produced quarry face[1]. The tilting angles of the boreholes in the second to last and last rows are determined using the formula $\alpha = 130^{\circ} - \beta$, where α – tilting angles of the boreholes to horizontal, in degrees, and β – calculated bank slope angle, degrees [1].

The deficiency of this method is that to establish a bank slope plane in its limiting position (in final contour) by blasting operations simultaneously for a depth of one or two ledges is only possible for rock represented by homogenous media or by two-layer, horizontal or flat-dipping strata with different resistances to shear stress.

The object of this invention - improving quarry face stability and decreasing deformation of multilayered structures with various resistances to shear stress by means of producing a concave-convex bank slope profile.

This object is achieved by modifying the procedure described in Patent No. 795077 as follows: intermediate rows of shortened vertical holes are drilled between the second to last and last rows of boreholes, with the nearest one to the last row being drilled to the foot of one of the subjacent layers, and the last one – to the foot of one of the superjacent layers. A straight line drawn between the bottoms of the boreholes in the last row and in the intermediate row closest to the last row shall be at 35 – 45° to horizontal, sloping down towards to mined area with length of less than 0.7 of the depth of the boreholes in the second to last row.

Fig. 1 shows the plan view of the quarry face with the layout diagram of the fragmentation bore holes; Fig. 2 – section A-A of Fig. 1, through the concave-convex bank slope profile with bore hole row diagram.

Vertical boreholes 1 are drilled in a few rows. The second to last row of boreholes 2 is drilled at a reverse angle of tilt α_2 between plane 3 and the newly produced bank slope 4 to the bottom edge of the slope foot 5 of the newly produced bank slope 4. The last row of boreholes 6 is drilled at a reverse angle of tilt α_1 to the boundary between the upper, hard, fissured layer 7 and middle, soft layer 8. The intermediate row of boreholes 9 before the last row 6 is drilled vertically to the boundary between the soft layer 8 and hard layer 10.

Figures 1 and 2 show one intermediate row of vertical boreholes 9, located just before the last row of boreholes 6. The other intermediate rows of vertical boreholes between the second to last 2 and last rows of boreholes 6 are not shown on Figures 1 and 2. A straight line connecting the bottoms of boreholes of the last row 6 and borehole bottoms of the intermediate row of vertical boreholes 9 forms bank slope 4 at 35° - 45° to the horizontal at its midsection, and its length does not exceed 0.7 of the depth of intermediate vertical boreholes 9.

Angles α_1 and α_2 represent the tilting angles of boreholes 6 and 2 to the horizontal. Angles β_1 and β_2 are calculated angles between plane 3 and the newly produced bank slope 4 at its upper and lower sections, respectively.

Angle $\beta_2 = 35 - 45^{\circ}$ is the calculated angle between plane 3 and the newly

[1] Translator Comment: The original text refers to the last row of boreholes twice, with different parameters. Its clearly incorrect.

produced bank slope 4 at its mid-section.

The proposed method of producing quarry faces results in concave-convex bank slope profiles for a depth of one, two, or more faces in multilayered structures with various resistances to shear stress, with improved bank stability beyond the limits of its slope.

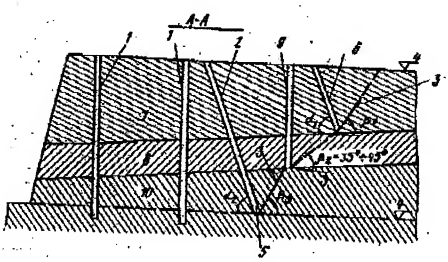

Fig 2.

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